

Claims

What is claimed is:

- 1 1. A composition suitable for use as a planarizing underlayer in a multilayer
2 lithographic process, said composition comprising:
 - 3 (a) a polymer containing:
 - 4 (i) cyclic ether moieties,
 - 5 (ii) saturated polycyclic moieties, and
 - 6 (iii) aromatic moieties, and
 - 7 (b) an acid generator.
- 1 2. The composition of claim 1 wherein said cyclic ether moieties are pendant
2 from acrylate monomers, said monomers forming at least a portion of said
3 polymer.
- 1 3. The composition of claim 1 wherein said polycyclic moieties are pendant
2 from acrylate monomers, said monomers forming at least a portion of said
3 polymer.
- 1 4. The composition of claim 1 wherein said polycyclic moieties are located in
2 a backbone portion of said polymer.
- 1 5. The composition of claim 1 wherein said aromatic moieties are pendant
2 from an ethylenic monomer, said monomer forming at least a portion of
3 said polymer.
- 1 6. The composition of claim 5 wherein said aromatic moieties are selected
2 from the group consisting of phenyl and phenol.

- 1 7. The composition of claim 1 wherein said polymer contains acrylate
2 monomers having both an polycyclic moiety and a cyclic ether moiety
3 pendant from said monomer.
- 1 8. The composition of claim 1 wherein said acid generator is a thermally
2 activated acid generator.
- 1 9. The composition of claim 1 wherein said acid polymer further comprises
2 fluorine-containing moieties.
- 1 10. The composition of claim 1 wherein said composition consists essentially
2 of components (a) and (b).
- 1 11. A lithographic structure on a substrate, said structure comprising:
2 (a) a planarizing underlayer comprising:
3 a polymer containing:
4 (i) cyclic ether moieties,
5 (ii) saturated polycyclic moieties, and
6 (iii) aromatic moieties, and
7 an acid generator.
4 (b) a radiation-sensitive imaging layer over said planarizing underlayer.
- 1 12. The structure of claim 11 wherein said layers are patterned such that
2 portions of said substrate are exposed.
- 1 13. The structure of claim 11 wherein said imaging layer is a silicon-containing
2 resist.

- 1 14. A method of forming a patterned material feature on a substrate, said
2 method comprising:
- 3 (a) providing a material layer on a substrate,
- 4 (b) forming a planarizing layer over said material layer, said
5 planarizing layer being formed by reacting a planarizing underlayer
6 composition, said underlayer composition comprising
7 a polymer containing:
8 (i) cyclic ether moieties,
9 (ii) saturated polycyclic moieties, and
10 (iii) aromatic moieties, and
11 an acid generator,
- 12 (c) forming a radiation-sensitive imaging layer over said planarizing
13 layer,
- 14 (d) patternwise exposing said imaging layer to radiation thereby
15 creating a pattern of radiation-exposed regions in said imaging
16 layer,
- 17 (e) selectively removing portions of said imaging layer and
18 planarizing layer to expose portions of said material layer, and
- 19 (f) etching said exposed portions of said material layer, thereby
20 forming said patterned material feature.

- 1 15. The method of claim 14 further comprising:
2 (g) removing any remaining portions of said imaging layer and said
3 planarizing layer from material layer.
- 1 16. The method of claim 14 wherein said radiation is ultraviolet radiation
2 having a wavelength less than 200 nm.
- 1 17. The structure of claim 14 wherein said imaging layer is a silicon-containing
2 resist.
- 1 18. The method of claim 14 wherein said material layer is selected from the
2 group consisting of dielectric, metals, and semiconductors.
- 1 19. A composition suitable for use as a planarizing underlayer in a multilayer
2 lithographic process, said composition comprising:
3 (a) a polymer containing:
4 (i) saturated polycyclic moieties, and
6 (ii) aromatic moieties,
7 (b) an acid generator, and
8 (c) a crosslinker.
- 1 20. The composition of claim 19 wherein said polymer further comprises
2 pendant hydroxyl moieties.